Industrial Engineering Journal
ISSN: 0970-2555
Volume : 54, Issue 4, April : 2025

SMART FARMING PLATFORM USING AI FOR CROP DISEASE DETECTION AND PREDICTION

J LALITHA PRASAD , Student, Department of CSE,
NIMRA COLLEGE OF ENGINEERING AND TECHNOLOGY, AP, India
Dr. G.MINNI, M.Tech.,Ph.D, Department of CSE
NIMRA COLLEGE OF ENGINEERING AND TECHNOLOGY, AP, India

ABSTRACT

In India, a major portion of the population relies on agriculture as their primary source of livelihood. However, the rising challenge of plant diseases has led to substantial losses in both crop quality and yield. Early and accurate detection of these diseases is essential for maintaining food security and improving farmers' income. This project aims to develop a Convolutional Neural Network (CNN)-based web application that assists in identifying plant diseases using images of affected crops.

The proposed system enables farmers to upload images through a user-friendly interface, which are then analyzed using a pre-trained CNN model to detect and classify potential diseases. The application is built using Python and deployed through cloud services to ensure scalability and real-time access. By integrating deep learning techniques with accessible technology, the system provides a practical solution for disease diagnosis, minimizing the need for physical consultations with agricultural experts. This tool empowers farmers with timely insights, reduces dependence on harmful chemical treatments, and ultimately supports sustainable agricultural practices.

INTRODUCTION:

Agriculture is the cornerstone of human sustenance. In densely populated developing nations like India, enhancing the yield and quality of crops, fruits, and vegetables is crucial. However, these objectives are often compromised by plant diseases, many of which are infectious and can lead to total crop failure. The vast expanse of agricultural lands, coupled with limited farmer education and scarce access to plant pathologists, renders human-assisted disease diagnosis insufficient. To address this gap, it's essential to develop automated, cost-effective, and accurate machine-assisted diagnostic tools that are easily accessible to farmers.

Advancements in technology, such as robotics and computer vision, have been explored to tackle various agricultural challenges. Image processing, in particular, has shown promise in precision agriculture, aiding in weed management, plant growth monitoring, and nutrition assessment. Deep learning algorithms, especially Convolutional Neural Networks (CNNs), have revolutionized image analysis since the success of "AlexNet" in the 2012 ImageNet competition. The synergy of enhanced computational power, extensive image datasets, and improved neural network algorithms has propelled AI's capabilities. Open-source platforms like TensorFlow have further democratized AI, making it more affordable and accessible.

Previous initiatives have focused on collecting images of healthy and diseased crops, employing techniques like feature extraction, RGB imaging, spectral analysis, and fluorescence spectroscopy. While neural networks have been utilized for plant disease identification, earlier approaches primarily relied on texture features. Our proposal leverages the advancements in mobile technology, cloud computing, and AI to create a comprehensive crop diagnosis solution. This platform emulates the expertise of plant pathologists, offering farmers a collaborative tool that continuously improves its disease classification accuracy through user contributions and expert feedback.

1. Literature Survey:

A Survey of Image Processing Techniques for Agriculture

Authors: *Lalit P. Saxena and Leisa J. Armstrong*

This paper reviews the application of image processing in agriculture, highlighting its role in enhancing productivity. Techniques discussed include precision agriculture practices, weed and herbicide technologies, plant growth monitoring, and nutrition management. The study underscores the potential of image processing in various agricultural contexts.

ImageNet Classification with Deep Convolutional Neural Networks

Authors: *A. Krizhevsky, I. Sutskever, and G. E. Hinton*

The authors trained a deep CNN to classify 1.2 million high-resolution images into 1,000 categories, achieving top-1 and top-5 error rates of 37.5% and 17.0%, respectively. The network comprises five convolutional layers and three fully connected layers, utilizing techniques like dropout for regularization. This model marked a significant advancement in image classification accuracy.

Integrating SOMs and a Bayesian Classifier for Segmenting Diseased Plants in Uncontrolled Environments

Authors: *D. L. Hernández-Rabadán, F. Ramos-Quintana, and J. Guerrero Juk*

This study presents a methodology combining self-organizing maps (SOMs) and a Bayesian classifier to segment diseased plants in uncontrolled environments. The approach addresses challenges like variable illumination and background interference, demonstrating improved performance over traditional color index methods.

EXISTING SYSTEM:

In India alone, 35% of field crops are lost to pathogens and pests causing losses to farmers. Indiscriminate use of pesticides is also a serious health concern as many are toxic and biomagnified. These adverse effects can be avoided by early disease detection, crop surveillance and targeted treatments. Most diseases are diagnosed by agricultural experts by examining external symptoms. However, farmers have limited access to experts.

Disadvantages:

Indiscriminate use of pesticides is also a serious health concern as many are toxic and biomagnified.

PROPOSED SYSTEM

In this project author using convolution neural network as artificial intelligence to train all plant diseases images and then upon uploading new images CNN will predict plant disease available in uploaded images. For storing CNN train model and images author is using cloud services. so, using AI author predicting plant disease and cloud is used to store data.

In this Project author using smart phone to upload image but designing android application will take extra cost and time so we build it as python web application. Using this

web application CNN model will get trained and user can upload images and then application will apply CNN model on uploaded images to predict diseases. If this web application deployed on real web server then it will extract users location from request object and can display those location in map

Advantages

Accurately identify diseases and get solutions with a mobile app by photographing affected plant parts.

MODULES DESCRIPTION

REGISTER :

In this module user/former has to register himself.

LOGIN:

In this module user/former has to login with valid user name and password.

UPLOAD PLANT IMAGE:

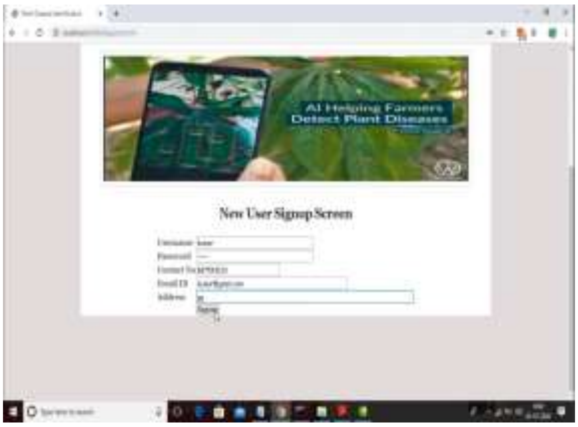
In this module user/former should upload plant image and can identify the plant disease.

LOGOUT:

After completion of user activities can logout from the application by using this module.

RESULT & ANALYSIS:

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 54, Issue 4, April : 2025



CONCLUSION:

This paper presents an automated, low cost and easy to use end-to-end solution to one of the biggest challenges in the agricultural domain for farmers – precise, instant and early diagnosis of crop diseases and knowledge of disease outbreaks - which would be helpful in quick decision making for measures to be adopted for disease control. This proposal innovates on known prior art with the application of deep Convolutional Neural Networks (CNNs) for disease classification, introduction of social collaborative platform for progressively improved accuracy, usage of geocoded images for disease density maps and expert interface for analytics. High performing deep CNN model "Inception" enables real time classification of diseases in the Cloud platform via a user facing mobile app. Collaborative model enables continuous improvement in disease classification accuracy by automatically growing the Cloud based training dataset with user added images for retraining the CNN model. User added images in the Cloud repository also enable rendering of disease density maps based on collective disease classification data and availability of geolocation information within the images. Overall, the results of our experiments demonstrate that the proposal has significant potential for practical deployment due to multiple dimensions – the Cloud based infrastructure is highly scalable and the underlying algorithm works accurately even with large number of disease categories, performs better with high fidelity real-life training data, improves accuracy with increase in the training dataset, is capable of detecting early symptoms of diseases and is able to successfully differentiate between diseases of the same family.

REFERENCES:

[1] L. Saxena and L. Armstrong, "A survey of image processing techniques for agriculture," in Proceedings of Asian Federation for Information Technology in Agriculture, 2014, pp. 401-413.

[2] E. L. Stewart and B. A. McDonald, "Measuring quantitative virulence in the wheat pathogen Zymoseptoria tritici using high-throughput automated image analysis," in Phytopathology 104 9, 2014, pp. 985– 992.

[3] Krizhevsky, I. Sutskever and G. E. Hinton, "Imagenet classification with deep convolutional neural networks," in Advances in Neural Information Processing Systems, 2012.

[4]TensorFlow.[Online].Available: https://www.tensorflow.org/

[5] D. P. Hughes and and M. Salathé, "An open access repository of images on plant health to enable the development of mobile disease diagnostics through machine learning and crowdsourcing," in CoRR abs/1511.08060, 2015.

[6] S. Raza, G. Prince, J. P. Clarkson and N. M. Rajpoot, "Automatic detection of diseased tomato plants using thermal and stereo visible light images," in PLoS ONE, 2015.

[7] D. L. Hernández-Rabadán, F. Ramos-Quintana and J. Guerrero Juk, "Integrating soms and a bayesian classifier for segmenting diseased plants in uncontrolled environments," 2014, in the Scientific World Journal, 2014.

[8] S. Sankaran, A. Mishra, J. M. Maja and R. Ehsani, "Visible-near infrared spectroscopy for detection of huanglongbing in citrus orchards," in Computers and Electronics in. Agriculture 77, 2011, pp. 127–134.

[9] B. Wetterich, R. Kumar, S. Sankaran, J. B. Junior, R. Ehsani and L. G. Marcassa, "A comparative study on application of computer vision and fluorescence imaging spectroscopy for detection of huanglongbing citrus disease in the USA and Brazil," in Journal of Spectroscopy, 2013.

Industrial Engineering Journal
ISSN: 0970-2555
Volume : 54, Issue 4, April : 2025